REMARKS

Claims 1, 3-6, 22-24 and 37 are all the claims pending in the application.

New claim 37 is supported at least at page 4, fifth full paragraph, page 5, fourth full paragraph, the paragraph bridging pages 14 and 15 and Example 4.

Claim Rejection – 35 U.S.C. § 103

Claims 1, 3-6 and 22-24 are again rejected under 35 U.S.C. §103(a) as being unpatentable over Makuuchi et al. (U.S. Patent No. 6,117,815) in view of De Ambrosi et al. (U.S. Patent No. 4,987,222) for the reasons disclosed on pages 3-5 of the Office Action filed May 30, 2006.

The Examiner states that Applicant's arguments filed September 29, 2006 have been fully considered but they are not persuasive. The Examiner states that Applicant argues against the rejection on the ground that the Makuuchi et al. patent does not recite irradiating an electron beam to a polysaccharide having a molecular weight range of 5,000 to 70,000 Da. However, the Examiner maintains that the De Ambrosi et al. patent supplies this deficiency. According to the Examiner, the De Ambrosi et al. patent shows irradiation of polysaccharides having molecular weights within this range is well known in the art. The Examiner refers Applicant to, for example, Example 1.

With respect to Claims 22-24, the Examiner states that Applicant argues against the rejection by arguing that radiation with an electron beam can lower the molecular weight in a short time, whereas molecular weight lowered using gamma-ray radiation (see the De Ambrosi et

al. patent) requires longer times. According to the Examiner, this argument is not persuasive because no limitation of time is recited in the claims.

The Examiner goes on to state that Applicant also argues against the rejection on the ground that the De Ambrosi et al. patent does not disclose a hyaluronic acid fraction having a molecular weight of 600 to 1200 kDa in a liquid state being irradiated with an electron beam ranging from 10 to 80 kGy to obtain a hyaluronic acid having a molecular weight ranging from 1300 to 4000 Da. According to the Examiner, this argument is not persuasive because allegedly the De Ambrosi et al. patent does disclose gamma ray beams at doses within the range of 2.5 to 20 Mrad (i.e., 25 to 100 kGy as pointed out by Applicants in their remarks) which covers part of the range of 10-80 kGy disclosed in instant Claims 22-24 and the De Ambrosi et al. patent discloses obtaining glucosaminoglycans (including hyaluronic acid) having a molecular weight between 1,000 and 35,000 Daltons, which covers the molecular weight range of the hyaluronic acid of 1,300 to 4,000 Daltons disclosed in instant Claims 22-24.

The Examiner asserts that claims 22-24 recite preferred parameters, but without a showing of unexpected properties, preferred parameters will not overcome a *prima facie* case of obviousness.

For the following reasons, the rejection is traversed, respectfully.

1. Claims 1 and 3-6

The invention recited in claims 1 and 3-6 is characterized in that the molecular weight of a saccharide can be controlled by using the equation in claim 1. That is, the general idea of the

present invention is not to simply obtain a saccharide having a lowered molecular weight by irradiating a polysaccharide having a high molecular with an electron beam weight but also to obtain a saccharide having a desired molecular weight by suitably calculating the electron beam to be used according to the equation in claim 1.

In the present invention as claimed in claims 1 and 3-6, an electron beam is irradiated, whereas in De Ambrosi *et al.*, gamma rays are irradiated and the dosage is fixed to a total of 17.5 Mrad (175 kGy). Furthermore, in the present invention, a polysaccharide in a solid state is irradiated, whereas, in De Ambrosi *et al.*, a material in a liquid state is irradiated. Therefore, the present invention cannot easily be expected based on De Ambrosi *et al.* in which gamma rays are irradiated into a material in a liquid state which has a different decomposition efficiency from a solid sate (cf. Makuuchi *et al.*, col. 2, the third paragraph). Also, although electron beams are described in Makuuchi *et al.*, only γ-rays were irradiated in the examples in Makuuchi *et al.* Accordingly, the equation in claim 1 of the present application cannot be derived from De Ambrosi *et al.* and Makuuchi *et al.*

2. Claims 22-24

The dosages of irradiation in De Ambrosi *et al.* and Makuuchi *et al.* are as wide as 10 to 500 kGy and 2.5 to 20 Mrad (25 to 200 kGy), respectively. On the other hand, in the present invention as claimed in claims 22-24, hyaluronic acid (HA) having a molecular weight (Mw) of 2,500 to 4,000 Da can be obtained by irradiating HA in a liquid state with an electron beam of 10 to 30 kGy; HA having a Mw of 1,700 to 2,500 Da can be obtained by irradiating HA in a liquid state with an electron beam of 30 to 50 kGy; and HA having a Mw of 1,300 to 1,700 Da can be

obtained by irradiating HA in a liquid sate with an electron beam of 50 to 80 kGy. These specific combinations of small ranges cannot easily be expected from De Ambrosi *et al.* and Makuuchi *et al.*

In the Examples of De Ambrosi *et al.*, polysaccharides in a liquid state having a Mw of 14,000 Da, 32,000 Da, 13,000 to 16,000 Da and 14,000 Da were irradiated with gamma rays totaling of 17.5 Mrad (175 kGy) to thereby obtain a saccharide having a lower Mw of 5,000 Da, 6,300 Da, about 6,000 Da and about 7,000 Da, respectively. Also, in the Examples of Makuuchi *et al.*, sodium alginate (Mw: 420,000 Da) in a liquid state was irradiated with γ-rays of 10 kGy or 100 kGy to thereby obtain sodium alginate having a lower Mw of 40,000 kDa or 6,500 Da, respectively. On the other hand, in Examples of the present application, HA (Mw: 850,000 Da) in a liquid state was irradiated with an electron beam of 20 kGy, 40 kGy or 60 kGy to thereby obtain HA having a lower Mw of 3,200 Da, 1,900 Da or 1,500 Da, respectively. Therefore, irradiation with an electron beam according to the present invention can decompose a polysaccharide efficiently in comparison with irradiation with γ-rays taught in De Ambrosi *et al.* and Makuuchi *et al.* Also, even if HA having lowered Mw obtained in the present invention can be obtained by using γ-rays, a very high dosage of γ-rays would be required.

Thus, the specific combinations in claims 22 to 24 cannot easily be expected by one of ordinary skill in the art even if De Ambrosi *et al.* and Makuuchi *et al.* are combined.

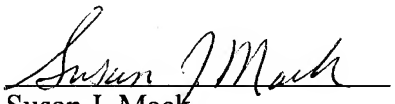
3. Claim 37

The Examiner's attention is also directed to new claim 37 which recites the glucosamimoglycan fraction is a fraction comprising at lest one of chondroitin sulfate D and chondroitin sulfate E. Chondroitin sulfate D and chondroitin sulfate E are not disclosed int eh cited references .

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,



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